Moving From QuickDraw to Quartz 2D

Session 215

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Graphics and Media

Moving From QuickDraw to Quartz 2D

Joseph Maurer
Quartz Bavarian

http://developer.apple.com/wwdc2005/

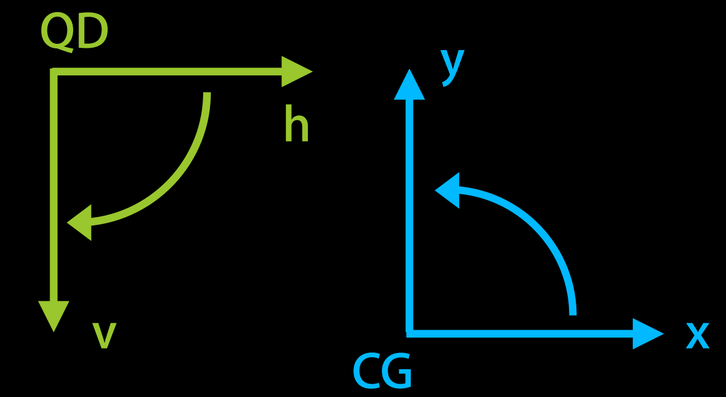
Something for Everybody

- More particularly: Carbon developers
  - Who are already somewhat knowledgeable in Quartz
  - Who understand the value of adopting HIViews
  - Who know the move to Quartz has to happen NOW!
- We start out simple
- But we advance fast!
- Three strikes
  - JustDraw
  - CarbonCGCompositor
  - MouseTracking

Hands-On Sample: JustDraw!

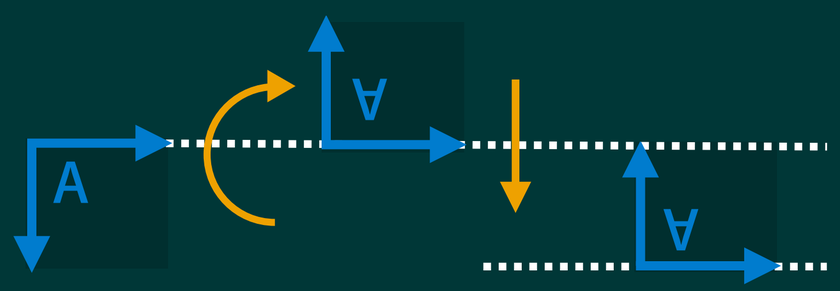
- Very basic application that shows minimal setup and drawing
- Main points
  - `CGContext` from HIView's `kEventControlDraw` event
  - HIView coordinate system is left-handed
  - Compensate with `CGContextSetTextMatrix`
  - Three ways to draw text
    - `CGContextShowText`
    - `HIThemeDrawTextBox`
    - Use ATSUI

Coordinates, Coordinates…



CGAffineTransformScale(1,-1)

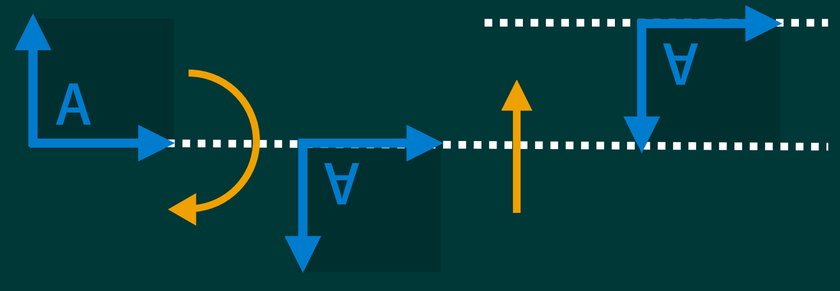
CGAffineTransformTranslate(0,height)



(x, y) ⟼ (x, height – y)

CGAffineTransformScale(1,-1)

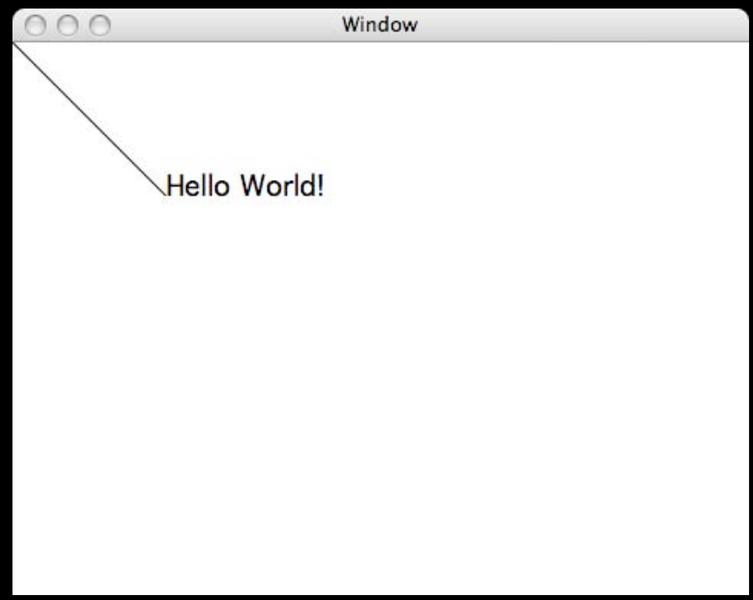
CGAffineTransformTranslate(0,height)



(x, y) ⟼ (x, height – y)

Hands-On Sample: JustDraw!

```
MoveTo(0, 0);
LineTo(100, 100);
TextFont(kFontIDGeneva);
TextSize(18);
DrawString(“\pHello World”);
```



Hands-On: JustDraw!

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More About Text Drawing

- `CGContextShowTextAtPoint()`
  - OK when `kCGEncodingMacRoman` is "good enough"
  - Minimal overhead, simple setup
- `HIThemeDrawTextBox()`
  - Recommended with the `ThemeFontID` virtual font ID values
  - (limited selection of fonts and sizes)
  - Also needs `GetThemeTextDimensions()`, in general
- `ATSUDrawText()`
  - The gold standard of multilingual text layout and rendering
  - Requires native Quartz coordinate system

Hands-On: JustDraw!

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What Did We Learn?

- HIView coordinates vs. native Quartz coordinates
- `CGAffineTransformMake(1, 0, 0, -1, 0, viewBoundsHeight)`
- If we come from QD, HIView coordinates are convenient
  - But text is upside-down
  - `CGContextSetTextMatrix` helps
- `HIThemeDrawTextBox` has “orientation” parameter
- ATSUI requires native (right-handed) Quartz coordinates
  - QD coordinates need to be recalculated
    - flipVertical: `y = viewBoundsHeight – v`

Hands-On: CarbonCGCompositor

Ted Jucevic
DTS Engineer

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What Is CarbonCGCompositor?

- Images are dragged in
- Adjust the image translucency
- Select a masking color
- Composite images on each other
- Drag out the results

CarbonCGCompositor…

- Drag and drop
  - CGImageSource
    - Accept all image formats
  - CGImageDestination
    - Drop JPEG file
- Adjusting the translucency
  - Alpha
  - Masking colors
- Color spaces
  - Easy color matching

CarbonCGCompositor…

- OffScreen drawing spaces
  - Coordinates
  - Creating images from…
- Regions
  - Shapes
- Premultiplication
  - Unmultiplying

Hands-On: CarbonCGCompositor

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CarbonCGCompositor

- Drag and drop
  - CGImageSource
  - CGImageDestination
- Copying image data
- Color management is easy

MouseTracking

Joseph Maurer

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MouseTracking

- `kEventControlTrack` and `kEventParamMouseLocation`
- “where” is HIPoint in local HIView coordinates
- `TrackMouseLocation()` and `MouseTrackingResult`
- “qdPt” is QuickDraw point in global coordinates
- `HIPointConvert()` to the rescue!

QuickDraw Code for MouseTracking

```
GetEventParameter(..., &where);   // local coordinates!
data->thePoly = OpenPoly();
MoveTo(where.x, where.y);

ShowPen();    // or we don’t see line drawing while poly open

while (true) {
   TrackMouseLocation(..., &qdPt, &mouseResult);
   if ( mouseResult == kMouseTrackingMouseReleased ) {
          HidePen();                  // to balance extra ShowPen call, above
          ClosePoly();
     break;
    }
   where = ConvertGlobalQDPointToViewHIPoint(qdPt, theView);
   LineTo(where.x, where.y);

   HIViewSetNeedsDisplay(theView, true);
} // while
```

CGPathRef and CGPathApply

- CGMutablePathRef—because we build it on the fly
- MyCGPathApplier()—to play it back
- Replaces QD polygons
- Replaces many usages of RgnHandles
- ImageMasks will replace the other RgnHandles

Hands-On: MouseTracking (1)

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LoadImageFromMainBundle

- At `kEventHIObjectInitialize` time
- Replace PICT resources by .jpg, .png files
- `CGImageCreateWith... DataProvider` now goes through `ImageIO`, internally

Replacing Regions and CopyBits (1)

- Clip path instead of clip region
- “Soft mask” instead of masking region
- Either: `imageMask = CGImageCreate()` and `maskedImage = CGImageCreateWithMask()`
- Or: `CGImageCreateWithMaskingColors()`
- Before Tiger: need to work alpha into pixels of a `CGBitmapContext`

Replacing Regions and CopyBits (2)

- Alpha instead of `CopyMask()`, `CopyDeepMask()`
- Take advantage of buffered windows and HIViews
  - Fewer offscreens, cleaner code
- CGContextDrawImage: the `CopyBits` killer
  - Source pixels provided by CGImageRef's dataProvider
- Don't even need overlay windows, in many cases
- Watch `DoTheHitTest()`, with 1x1 `CGBitmapContext`

Hands-On: MouseTracking (2)

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In Summary

- HIViews are the way to go
- Get used to CGAffineTransforms
  - … and some coordinate juggling
- CGPathRefs are convenient (both for drawing and clipping)
- No need for CopyBits/CopyDeepMask and RgnHandles
  - Use clip paths, CGBitmapContexts and masked CGImages
- Above all: really get rid of QuickDraw now
  - … for fun and profit!

Oh, One More Thing…

- CarbonSketch is at revision 2.0
- HIView-based—much simpler code
- Support for opening PDF files
  - Deals correctly with password-protected PDFs
- And then some more improvements
- Watch out for it!

Related Sessions

Optimal 2D Application Graphics	Session 216 Friday 10:30AM
Transitioning From QuickDraw	Tiger Lab Friday 12:00PM
Optimize Your 2D Drawing	Tiger Lab Friday 3:30PM

Who to Contact

Travis Brown
Graphics and Imaging Evangelist
travis@apple.com

Q&A

Travis Brown
Graphics and Imaging Evangelist
travis@apple.com

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